

M1. General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------|------|--|
| Good | 16 | Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 14 | |
| | 12 | |
| | | |
| Average | 10 | Some of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved. |
| | 8 | |
| | 6 | |
| | | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Additional guidance for assessing Scientific Content and Breadth of Knowledge in Essays

The following provides guidance about topics which might be included in the essays. It is not an exclusive list; the assessment of scientific content does not place restrictions on topics that candidates might refer to, provided they are

- relevant;
- at an appropriate depth for A level and
- accurate.

It is not expected that candidates would refer to all, or even most, of the topics to gain a top mark; the list represents the variety of approaches commonly encountered in the assessment to the essays.

In both essays, topics either from the option modules or beyond the scope of the specification were also given credit where appropriate.

The causes of variation and its biological importance

1. Gene mutation (G)
 - addition
 - deletion
 - substitution
 - effect on alleles
 - effect on polypeptide / protein
2. Sexual reproduction (S)
 - crossing over
 - independent assortment
 - random fusion
 - (allow *chromosome mutation*)
3. Environmental (E)
 - nutrients
 - disease
 - light
 - temperature
4. Biological importance (B)
 - enables adaptation
 - natural selection
 - speciation
 - evolution

Breadth of knowledge

- 3 marks Three of the above four areas including cause and importance
 2 marks Two of the above four areas including cause and importance
 1 mark Two of the above four areas

M2. General Principles for marking the Essay:

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| | 6 | |
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| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
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Relevance (maximum 3 marks)

| Mark | Descriptor |
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| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
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| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
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Quality of language (maximum 3 marks)

| Mark | Descriptor |
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- accurate.

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How the structure of proteins in relation to their functions.

1. Structure (S)
 primary structure – peptide bond
 secondary structure
 tertiary structure. Globular - bonds between R groups give spherical shape – shape determines function – active sites and receptor sites
(allow quaternary structure – haemoglobin incorporates ions for oxygen transport)

2. Structural proteins (ST)
fibrous – regular pattern of hydrogen bonds – coiling,
(e.g. *keratin coils twist together to form rope-like structures – flexible and strong*)
(e.g. *collagen – coils more tightly bound – more rigid*)
3. Transport (T)
channel – complementary shape – charges – gated
carrier – complementary shape – can change shape
active transport – phosphate group attached by energy from
ATP – can change shape
4. Enzymes (E)
active site, enzyme-substrate complex
activation energy reduction - explanation e.g. brings molecules closer
5. Receptors (R)
synapse
insulin / glucagon
ADH
rhodopsin
6. Muscle (M)
actin thin – binding site
myosin thick - cross bridges
tropomyosin – block binding sites

Breadth of knowledge

- 3 marks Four or more of the above 6 areas
2 marks Three of the above 6 areas
1 mark Two of the above 6 areas

- M3.** (i) mRNA attaches to ribosome;
codon on mRNA;
binds to an anti-codon on tRNA;
each tRNA brings a specific amino acid;
sequence of codons/bases on mRNA determines order of amino acids;
formation of peptide bonds/amino acids joined by condensation
reactions;

4 max

- (iii) inserted gene/mRNA complementary to normal gene/mRNA;
binds to it to prevent protein synthesis/form double strand/prevents
mRNA binding to ribosomes;
will not stop all translation, some mRNA reaches ribosomes/
because not all mRNA is bound by inserted gene mRNA;

2 max

[6]

M4. General Principles for marking the Essay:

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|----------|------|--|
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| | 14 | |
| | 12 | |
| | | |
| Average | 10 | Some of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved. |
| | 8 | |
| | 6 | |
| | | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
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Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
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[25]

Guidelines for marking the essay**Introduction**

The essay is intended for the assessment of AO4 (Synthesis of knowledge, understanding and skills) and Quality of Written Communication (Sections 6.4 and 6.5 in the specification).
Examiners are looking for

- evidence of knowledge and understanding at a depth appropriate to A level
- selection of relevant knowledge and understanding from different areas of the specification
- coverage of the main concepts and principles that might be reasonably be expected in relation to the essay title
- connection of concepts, principles and other information from different areas in response to the essay title
- construction of an account that forms a coherent response
- clear and logical expression, using accurate specialist vocabulary appropriate to A level

Assessing Scientific Content

Maximum 16 marks.

Descriptors are divided into 3 categories:

Good (16, 14, 12), Average (10, 8, 6) and Poor (4, 2, 0).

Only even scores can be awarded, i.e. not 15, 13, etc.

Examiners need first to decide into which category an essay comes.

A good essay

- includes a level of detail that could be expected from a comprehensive knowledge and understanding of relevant parts of the specification
- maintains appropriate depth and accuracy throughout
- avoids fundamental errors
- covers a majority of the main areas that might be expected from the essay title (These areas will be indicated in the mark scheme). (Occasionally a candidate may tackle an essay in an original or unconventional way. Such essays may be biased in a particular way, but where a high level of understanding is shown a high mark may be justified.)
- demonstrates clearly the links between principles and concepts from different areas.

Note that it is not expected that an essay must be 'perfect' or exceptionally long in order to gain maximum marks, bearing in mind the limitations on time and the pressure arising from exam conditions.

An average essay

- should include material that might be expected of C/D/E grade candidates
- is likely to have less detail and be more patchy in the depth to which areas are covered, and to omit several relevant areas
- is likely to include some errors and misunderstandings, but should have few fundamental errors
- is likely to include mainly more superficial and less explicit connections

A poor essay

- is largely below the standard expected of a grade E candidate
- shows limited knowledge and understanding of the topic
- is likely to cover only a limited number of relevant areas and may be relatively short
- is likely to provide superficial treatment of connections
- includes several errors, including some major ones

Having decided on the basic category, examiners may award the median mark, or the ones above or below the median according to whether the candidate exceeds the requirements or does not quite meet them.

Marking the essay

In marking scientific content, letters in the margin show each key area covered; these are used to assess the breadth of criteria. A single tick is used to indicate accurate coverage of each significant area, and a double tick to emphasise 'good depth of content.' Errors are indicated with a cross. A squiggly line in the margin is used to highlight irrelevance and 'Q' to highlight poor use of terminology, unclear grammar and inappropriate style.

Specific guidance for assessing Scientific Content and Breadth of Knowledge in Essays

The following provides guidance about topics which might be included in the essays. It is not an exclusive list; the assessment of scientific content does not place restrictions on topics that candidates might refer to, provided they are

- relevant;
- at an appropriate depth for A level and
- accurate.

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Energy transfers which take place in living organisms

- (1) ATP (A)
synthesis from ADP and P
role as an energy source
- (2) photosynthesis (P)
excitation of electrons
generation of ATP and reduced NADP
photolysis
reduction of glycerate phosphate to carbohydrate
structure of chloroplast in relation to energy transfers
- (3) respiration (R)
net gain of ATP in glycolysis
production of ATP in Krebs cycle
synthesis of ATP associated with electron transfer chain
ATP production in anaerobic respiration
structure of mitochondrion in relation to energy transfers
- (4) uses of energy in biological processes (B)

active transport
muscle contraction
nerve transmission
synthesis
translocation
kidney function
nitrogen fixation
receptors

Breadth of knowledge

| | |
|---------|--------------------------|
| 3 marks | reference to all 4 areas |
| 2 marks | ATP + 2 other areas |
| 1 mark | any 2 areas |

M5. General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

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| | 12 | |
| | | |
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| | 8 | |
| | 6 | |
| | | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

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Guidelines for marking the essay

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Assessing Scientific Content

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The process of osmosis and its importance to living organisms

- (1) definition (D)
- (2) effects on cells (C)
 - turgity and support
 - plasmolysis (idea)
 - lysis
 - cystic fibrosis
- (3) importance in animals (A)
 - role in relationship between plasma and tissue fluid
 - role in medulla of kidney
 - reabsorption in gut
 - sweat production neutral*
- (4) importance in plants (P)
 - role in movement of water from soil to leaves in plants
 - role in mass flow hypothesis for movement in plants

Breadth of knowledge

| | |
|---------|----------------------------|
| 3 marks | reference to all 4 areas |
| 2 marks | definition + 2 other areas |
| 1 mark | any 2 areas |

(b) Energy transfers which take place in living organisms

- (1) ATP (A)
 - synthesis from ADP and P
 - role as an energy source
- (2) photosynthesis (P)
 - excitation of electrons
 - generation of ATP and reduced NADP
 - photolysis
 - reduction of glycerate phosphate to carbohydrate
 - structure of chloroplast in relation to energy transfers
- (3) respiration (R)
 - net gain of ATP in glycolysis
 - production of ATP in Krebs cycle
 - synthesis of ATP associated with electron transfer chain
 - ATP production in anaerobic respiration
 - structure of mitochondrion in relation to energy transfers
- (4) uses of energy in biological processes (B)
 - active transport
 - muscle contraction
 - nerve transmission
 - synthesis
 - translocation
 - kidney function
 - nitrogen fixation
 - receptors

Breadth of knowledge

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Enzymes and their importance in plants and animals

- (1) principles of enzyme action (A)
e.g. catalysis, protein structure, active site, activation energy, enzyme-substrate complex, specificity.

good candidates relate protein structure to specificity /active site, catalysis to activation energy.

- (2) factors affecting enzyme action (F)
e.g. temperature, pH, enzyme/substrate concentration, inhibition.

good candidates – relate changes in activity to denaturing/tertiary structure; effects of concentration to active site availability, distinguish competitive/non-competitive inhibition.

- (3) enzyme synthesis (S)
reference to protein synthesis; link to genes, gene expression, effects of mutation.

good candidates – appreciation of connection between genes and enzyme production, e.g. 'one gene, one enzyme'.

roles and functions of enzymes in different processes. In each case good candidates should specify enzyme and its function.

- (4) digestion (D)
enzymes involved in mammalian digestive system, breakdown of polymers in other circumstances, e.g. saprophytic digestion/ mobilisation of storage compounds.

good candidates – range of enzymes giving source and action in sequence in mammalian digestion; reference to other breakdown.

- (5) metabolic pathways - photosynthesis (Ps) and respiration (R)
e.g. light independent reaction, Krebs cycle, ATP formation.

good candidates - reference to specific roles e.g. in l.i.r., distribution in mitochondria/chloroplasts.

- (6) other specific examples
 e.g. in nervous system (N), such as role of acetylcholinesterase in synapses,
 in homeostasis (H), such as in glycogenesis,
 in muscle action (M), such as role of ATPase,
 in fertilisation (Sp), such as enzymes in acrosome,
 in transcription / translation (T), such as role of polymerases.

Breadth of Knowledge

- 3 marks significant coverage of areas 1 and 2, + 3 others,
 or brief references to 5 others
 2 marks areas 1 or 2 + 2 other areas, or brief reference to 5 + areas in total
 1 mark any 3 areas

- M7.** (a) (cut out gene using an) endonuclease / restriction enzyme;
 reference to specificity / recognition site;
 sticky ends;
 use the same enzyme to cut;
 plasmid / virus / potato DNA;
 fixed by ligase;
 method of introducing vector e.g. micropipette / virus injects DNA /
 remove plant cell wall;

6 max

- (b) introduced gene / characteristic passed to offspring;
 rapid process;
 larger number of plants produced;
 asexual reproduction genetically identical / sexual reproduction
 causes variation;

3 max

- (c) different genes are expressed;
 producing different enzymes/proteins;

2

[11]

M8. General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------|------|--|
| Good | 16 | Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 14 | |
| | 12 | |
| | | |
| Average | 10 | Some of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved. |
| | 8 | |
| | 6 | |
| | | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Topic areas for assessment of scientific content:

- (1) principle of destabilising effect of rising temperature on metabolic systems within organisms and on balance in ecosystems. (P)
- (2) effect on rate of diffusion/gaseous exchange; possible consequences, e.g. increased evaporation, more rapid uptake of ions by plants. (D)
- (3) effect on proteins; possible increased rate of denaturation of tertiary structure. Increased rate of enzyme activity; possible increased dislocation of metabolic pathways. (E)
- (4) effect on photosynthesis (light independent reaction); increased rate with small increases, disruption with larger; increased rate of growth of (some) plants; possible increased rate of crop growth; effect of other limiting factors. (PS)
- (5) effect on transpiration; increased rate of water loss and hence wilting/dehydration; reduced stomatal opening may affect photosynthesis; possible consequences of drought on ecosystems. (T)
- (6) effect on respiration and metabolism; increased effect on growth and activity, especially of ectotherms. (M)
- (7) ecological effects of disruption of food webs and the dynamics of ecosystems, with changes in niches and hence communities. (EC)
- (8) effect on species; extinction of species that are unable to adapt, especially ones with specialised requirements; limited opportunity for plants and some animals to spread to more suitable conditions as climate changes. (S)
- (9) effect on agriculture; increased growth of some crops and loss of others, and effect on productivity; possible redistribution to different parts of the world, and overall loss of agricultural land. (A)

- (10) ecological effect of increased rates of growth and reproduction, especially of bacteria, insects and pests; possible increased incidence of disease.

(R)

- (11) role of natural selection in adaptation to change.

(N)

There are many possible alternative approaches to this essay and any biologically sensible effect of increasing change in temperature on living organisms should be credited. In a good essay the specific effects of rising temperature will be explained and explicitly linked to their possible effects on physiology or ecology. A good candidate will also recognise the complex interactions involved and avoid giving simplistic explanations and doomsday scenarios.

Assessment of breadth of knowledge:

- 3 marks: includes descriptions of at least 5 different areas, including both physiological and ecological effects.
- 2 marks: refers to 3 different areas, including at least one physiological and one ecological.
- 1 mark: refers to 2 different areas

Guidelines for marking the essay

Introduction

The essay is intended for the assessment of AO4 (Synthesis of knowledge, understanding and skills) and Quality of Written Communication (Sections 6.4 and 6.5 in the specification). Examiners are looking for

- evidence of knowledge and understanding at a depth appropriate to A level
- selection of relevant knowledge and understanding from different areas of the specification
- coverage of the main concepts and principles that might be reasonably be expected in relation to the essay title
- connection of concepts, principles and other information from different areas in response to the essay title
- construction of an account that forms a coherent response
- clear and logical expression, using accurate specialist vocabulary appropriate to A level

Assessing Scientific Content

Maximum 16 marks.

Descriptors are divided into 3 categories: Good (16, 14, 12), Average (10, 8, 6) and Poor (4, 2, 0). Only even scores can be awarded, i.e. not 15, 13, etc.

Examiners need first to decide into which category an essay comes.

A good essay

- includes a level of detail that could be expected from a comprehensive knowledge and understanding of relevant parts of the specification
- maintains appropriate depth and accuracy throughout
- avoids fundamental errors
- covers a majority of the main areas that might be expected from the essay title (These areas are indicated in the mark scheme). (Occasionally a candidate may tackle an essay in an original or unconventional way. Such essays may be biased in a particular way, but where a high level of understanding is shown a high mark may be justified.)
- demonstrates clearly the links between principles and concepts from different areas.

Note that it is not expected that an essay must be 'perfect' or exceptionally long in order to gain maximum marks, bearing in mind the limitations on time and the pressure arising from exam conditions.

An average essay

- should include material that might be expected of C/D/E grade candidates
- is likely to have less detail and be more patchy in the depth to which areas are covered, and to omit several relevant areas
- is likely to include some errors and misunderstandings, but should have few fundamental errors
- is likely to include mainly more superficial and less explicit connections

A poor essay

- is largely below the standard expected of a grade E candidate shows limited knowledge and understanding of the topic
- is likely to cover only a limited number of relevant areas and may be relatively short
- is likely to provide superficial treatment of connections includes several errors, including some major ones

Having decided on the basic category, examiners may award the median mark, or the ones above or below the median according to whether the candidate exceeds the requirements or does not quite meet them.

Marking the essay

In marking scientific content, letters in the margin show each key area covered; these are used to assess the breadth of criteria. A single tick is used to indicate accurate coverage of each significant area, and a double tick to emphasise 'good depth of content.' Errors are indicated with a cross. A squiggly line in the margin is used to highlight irrelevance and 'Q' to highlight poor use of terminology, unclear grammar and inappropriate style.

Specific guidance for assessing Scientific Content and Breadth of Knowledge in Essays

The following provides guidance about topics which might be included in the essays. It is not an exclusive list; the assessment of scientific content does not place restrictions on topics that candidates might refer to, provided they are

- relevant;
- at an appropriate depth for A level and
- accurate.

It is not expected that candidates would refer to all, or even most, of the topics to gain a top mark; the list represents the variety of approaches commonly encountered in the assessment to the essays. In both essays, topics either from the option modules or beyond the scope of the specification should also given credit where appropriate.

M9. General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------|------|--|
| Good | 16 | Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 14 | |
| | 12 | |
| | | |
| Average | 10 | Some of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved. |
| | 8 | |
| | 6 | |
| | | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Topic areas for assessment of scientific content:

- (1) principle of negative feedback – departure from a norm initiates changes which restore a system to the norm.
(P)
- (2) importance in homeostasis; principles of detection of change, role of receptors, corrective response, role of effectors.
(H)
- (3) thermoregulation; roles of thermoreceptors and hypothalamus in detection; heat loss and heat gain centres; sweating and vasodilatation in heat loss; vasoconstriction, hair erection, shivering and increased metabolism in heat gain.
(T)
- (4) regulation of blood glucose; roles of receptors in pancreas, secretion of insulin or glucagon; effect of insulin on surface membrane receptors/carrier proteins in stimulating uptake of glucose and glycogenesis; role of glucagon in glycogenolysis.
(G)

- | | |
|--|-------|
| (5) regulation of blood water potential; role of receptors in hypothalamus; secretion of ADH from pituitary; effect of ADH on permeability of d.c.t. and collecting duct; role of loop of Henle in maintaining high ion concentration in the medulla; effect on urine concentration. | (W) |
| (6) control of ventilation; stimulation of chemoreceptors in medulla; effect on inspiration; stimulation of stretch receptors in lungs; stimulation of expiratory cells in medulla. | (B) |
| (7) control of heartbeat; roles of chemoreceptors and pressure receptors; inhibitory and acceleratory centres in medulla; effect on SAN and rate of heartbeat; effect of change in rate on pH/pressure of blood. | (HB) |
| (8) metabolic pathways; examples of build-up of a product in a metabolic pathway resulting in inhibition of its formation. | (M) |
| (9) population stability; effect of increasing competition/predation on increasing population size and restoration of balance. | (Pop) |
| (10) (selection – stabilising selection resulting in constancy of species) | (S) |
| (11) (Oestrous cycle; effect of feedback on hormone production, e.g. oestrogen on FSH and progesterone on both FSH and LH. From Option 8) | (O) |

Any other sensibly argued example showing negative feedback should be credited.

In a good essay the description of the changes in a system should be clearly related to the principles of negative feedback, with sufficient detail for the relationship to be explained.

Assessment of breadth of knowledge:

- | | |
|---------|--|
| 3 marks | Clear understanding of principle of negative feedback and coverage of 4 examples with sufficient detail to illustrate the principle effectively. |
| 2 marks | 3 examples described in some detail, but without necessarily making the link explicit. |
| 1 mark | reference to 2 examples. |

Guidelines for marking the essay

Introduction

The essay is intended for the assessment of AO4 (Synthesis of knowledge, understanding and skills) and Quality of Written Communication (Sections 6.4 and 6.5 in the specification).
Examiners are looking for

- evidence of knowledge and understanding at a depth appropriate to A level
- selection of relevant knowledge and understanding from different areas of the specification
- coverage of the main concepts and principles that might be reasonably be expected in relation to the essay title
- connection of concepts, principles and other information from different areas in response to the essay title
- construction of an account that forms a coherent response
- clear and logical expression, using accurate specialist vocabulary appropriate to A level

Assessing Scientific Content

Maximum 16 marks.

Descriptors are divided into 3 categories: Good (16, 14, 12), Average (10, 8, 6) and Poor (4, 2, 0). Only even scores can be awarded, i.e. not 15, 13, etc.
Examiners need first to decide into which category an essay comes.

A good essay

- includes a level of detail that could be expected from a comprehensive knowledge and understanding of relevant parts of the specification
- maintains appropriate depth and accuracy throughout
- avoids fundamental errors
- covers a majority of the main areas that might be expected from the essay title (These areas are indicated in the mark scheme). (Occasionally a candidate may tackle an essay in an original or unconventional way. Such essays may be biased in a particular way, but where a high level of understanding is shown a high mark may be justified.)
- demonstrates clearly the links between principles and concepts from different areas.

Note that it is not expected that an essay must be 'perfect' or exceptionally long in order to gain maximum marks, bearing in mind the limitations on time and the pressure arising from exam conditions.

An average essay

- should include material that might be expected of C/D/E grade candidates
- is likely to have less detail and be more patchy in the depth to which areas are covered, and to omit several relevant areas
- is likely to include some errors and misunderstandings, but should have few fundamental errors
- is likely to include mainly more superficial and less explicit connections

A poor essay

- is largely below the standard expected of a grade E candidate shows limited knowledge and understanding of the topic
- is likely to cover only a limited number of relevant areas and may be relatively short
- is likely to provide superficial treatment of connections includes several errors, including some major ones

Having decided on the basic category, examiners may award the median mark, or the ones above or below the median according to whether the candidate exceeds the requirements or does not quite meet them.

Marking the essay

In marking scientific content, letters in the margin show each key area covered; these are used to assess the breadth of criteria. A single tick is used to indicate accurate coverage of each significant area, and a double tick to emphasise 'good depth of content.' Errors are indicated with a cross. A squiggly line in the margin is used to highlight irrelevance and 'Q' to highlight poor use of terminology, unclear grammar and inappropriate style.

Specific guidance for assessing Scientific Content and Breadth of Knowledge in Essays

The following provides guidance about topics which might be included in the essays. It is not an exclusive list; the assessment of scientific content does not place restrictions on topics that candidates might refer to, provided they are

- relevant;
- at an appropriate depth for A level and
- accurate.

It is not expected that candidates would refer to all, or even most, of the topics to gain a top mark; the list represents the variety of approaches commonly encountered in the assessment to the essays. In both essays, topics either from the option modules or beyond the scope of the specification should also given credit where appropriate.

M10. General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------|------|--|
| Good | 16 | Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 14 | |
| | 12 | |
| | | |
| Average | 10 | Some of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved. |
| | 8 | |
| | 6 | |
| | | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Guidelines for marking the essay

Introduction

The essay is intended for the assessment of AO4 (Synthesis of knowledge, understanding and skills) and Quality of Written Communication (Sections 6.4 and 6.5 in the specification).
Examiners are looking for

- evidence of knowledge and understanding at a depth appropriate to A level
- selection of relevant knowledge and understanding from different areas of the specification
- coverage of the main concepts and principles that might be reasonably be expected in relation to the essay title
- connection of concepts, principles and other information from different areas in response to the essay title
- construction of an account that forms a coherent response
- clear and logical expression, using accurate specialist vocabulary appropriate to A level

Assessing Scientific Content

Maximum 16 marks.

Descriptors are divided into 3 categories: Good (16, 14, 12), Average (10, 8, 6) and Poor (4, 2, 0). Only even scores can be awarded, i.e. not 15, 13, etc.

Examiners need first to decide into which category an essay comes.

A good essay

- includes a level of detail that could be expected from a comprehensive knowledge and understanding of relevant parts of the specification
- maintains appropriate depth and accuracy throughout
- avoids fundamental errors
- covers a majority of the main areas that might be expected from the essay title (These areas will be indicated in the mark scheme). (Occasionally a candidate may tackle an essay in an original or unconventional way. Such essays may be biased in a particular way, but where a high level of understanding is shown a high mark may be justified.)
- demonstrates clearly the links between principles and concepts from different areas.

Note that it is not expected that an essay must be 'perfect' or exceptionally long in order to gain maximum marks, bearing in mind the limitations on time and the pressure arising from exam conditions.

An average essay

- should include material that might be expected of C/D/E grade candidates
- is likely to have less detail and be more patchy in the depth to which areas are covered, and to omit several relevant areas
- is likely to include some errors and misunderstandings, but should have few fundamental errors
- is likely to include mainly more superficial and less explicit connections

A poor essay

- is largely below the standard expected of a grade E candidate
- shows limited knowledge and understanding of the topic
- is likely to cover only a limited number of relevant areas and may be relatively short
- is likely to provide superficial treatment of connections
- includes several errors, including some major ones

Having decided on the basic category, examiners may award the median mark, or the ones above or below the median according to whether the candidate exceeds the requirements or does not quite meet them.

Marking the essay

In marking scientific content, letters in the margin show each key area covered; these are used to assess the breadth of criteria. A single tick is used to indicate accurate coverage of each significant area, and a double tick to emphasise 'good depth of content.' Errors are indicated with a cross. A squiggly line in the margin is used to highlight irrelevance and 'Q' to highlight poor use of terminology, unclear grammar and inappropriate style.

Specific guidance for assessing Scientific Content and Breadth of Knowledge in Essays

The following provides guidance about topics which might be included in the essays. It is not an exclusive list; the assessment of scientific content does not place restrictions on topics that candidates might refer to, provided they are

- relevant;
- at an appropriate depth for A level and
- accurate.

It is not expected that candidates would refer to all, or even most, of the topics to gain a top mark; the list represents the variety of approaches commonly encountered in the assessment to the essays. In both essays, topics either from the option modules or beyond the scope of the specification should also given credit where appropriate.

Breadth of Knowledge

| | |
|---------|--|
| 3 marks | five topics - at least two from each set of examples |
| 2 marks | five from one set of topics |
| | four topics - at least one from each set |
| 1 mark | three topics |

M11. General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------|------|--|
| Good | 16 | Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 14 | |
| | 12 | |
| | | |
| Average | 10 | Some of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved. |
| | 8 | |
| | 6 | |
| | | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

M12. General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------------|------|--|
| Good | 16 | Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 14 | |
| | 12 | |
| Average | 10 | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved. |
| | 8 | |
| | 6 | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Additional notes on marking this question

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will. These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally be from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

Ways in which different species of organisms differ from each other

| Biology | | Human Biology |
|---------|--|---------------|
| 10.4 | Molecular differences Large molecules are important in the structure and functioning of Cells (proteins) | 10.4 |
| 11.3 | Genetic differences Genes incorporate coded information which determines the metabolism of organisms | 12.5 |
| 14.2 | Genes and environmental factors influence variation between individuals | 14.2 |
| 14.3 | Selection can influence the frequency of alleles in a population | 14.3 |
| 14.4 | Evolution has resulted in different species of organisms | 14.4 |
| 10.1 | Other aspects of biology The cell is the basic unit of structure in prokaryotic and eukaryotic organisms | |
| 14.5 | The concept of ecosystem (niches) | 14.5 |
| 15.5 | Different organisms possess different types of haemoglobin with different oxygen transporting properties | |
| 15.4 | Limitation of water loss in xerophytic plants | |
| 15.6 | Digestion of cellulose | |
| | Bacteria as examples of pathogenic microorganisms | 12.1/12.9 |
| | Principles of immunology | 12.3 |

M13. *General Principles for marking the Essay:*

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------------|------|--|
| Good | 16 | Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 14 | |
| | 12 | |
| Average | 10 | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved. |
| | 8 | |
| | 6 | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Additional notes on marking this question

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will. These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally be from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

The transfer of energy between different organisms and between these organisms and their environment.

| Biology | | Human Biology |
|----------------|---|----------------------|
| 14.6 | Photosynthesis Photosynthesis uses energy from sunlight to synthesis organic molecules from inorganic sources | 14.6 |
| 14.7 | Ecology Energy is transferred through food chains and food webs in a community | 14.7 |
| 14.8 | Energy loss Respiration produces ATP which is the immediate form of energy for many cell activities | 14.8 |
| 15.2 | Temperature control | 16.11 |
| 15.9 | Receptors convert stimuli into electrical impulses in nerve cells | 16.8 |
| | Dietary demands of pregnancy | 16.5 |

M14. Quality of Communication

The answers to all sections of this question require the use of continuous prose. Quality of language should be considered in crediting points in the scheme. In order to gain credit, answers should be expressed logically and unambiguously, using scientific terminology where appropriate.

- (a)
1. Deviation of a value from norm initiates corrective mechanisms;
 2. fluctuations in plasma glucose concentration detected by hypothalamus/ islet cells in pancreas;
 3. initial decrease, no food given (in plasma glucose) stimulates (increased) secretion of glucagon;
 4. increases (in plasma glucose) stimulate (increased) secretion of insulin;
 5. correct ref. to role of α and/or β cells as secretors;
 6. correct ref. to interconversion of glycogen / glucose;
 7. increased/decreased uptake of glucose by cells (as appropriate)/correct ref to change in membrane permeability;

max 5

- (b) (i)
1. Sensors in skin/hypothalamus detect reduced temperature;
 2. heat gain centre activated/inhibition of heat loss centre;
 3. vasoconstriction/constriction of arterioles in skin surface; (R capillaries)
 4. dilation of shunt vessels/constriction of – capillary sphincter;
 5. less blood to skin surface/capillaries
 6. reduced heat loss by radiation;
 7. increased heat gain by increased metabolic rate/respiration/ movement/shivering;
 8. decreased heat loss by putting on clothes/huddling/reduced sweating;

max 5

- (ii) 1. Body temp./37 °C is optimum temp for enzymes;
 2. excess heat denatures enzymes/alters tertiary structure/
 alters shape of active site/enzyme;
 3. substrate cannot bind/eq,;
 4. reactions cease/slowed;
 5. too little reduces kinetic energy of molecules / molecules
 move more slowly;
 6. fewer collisions/fewer ES complexes formed'

max 5

[15]

M15. General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------|------|---|
| Good | 16 | Most of the material of a high standard reflecting a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 14 | |
| | 12 | |
| | | |
| Average | 10 | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any fundamental errors. Shows a sound understanding of most of the principles involved. |
| | 8 | |
| | 6 | |
| | | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most if not all areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect |
| 0 | Material entirely irrelevant. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|--|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Additional notes

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will.

These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally be drawn from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

M16. General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------------|------|---|
| Good | 16 | Most of the material of a high standard reflecting a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 14 | |
| | 12 | |
| Average | 10 | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any fundamental errors. Shows a sound understanding of most of the principles involved. |
| | 8 | |
| | 6 | |
| Poor | 4 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 2 | |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most if not all areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect |
| 0 | Material entirely irrelevant. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|--|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Additional notes

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will.

These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally be drawn from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

M17. General principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------------|------|---|
| | 16 | |
| Good | 14 | Most of the material of a high standard reflecting a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 12 | |
| | 10 | |
| Average | 8 | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any fundamental errors. Shows a sound understanding of most of the principles involved. |
| | 6 | |
| | 4 | |
| Poor | 2 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most if not all areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect |
| 0 | Material entirely irrelevant. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|--|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Additional notes on marking

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will be. These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally be drawn from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

M18. General principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------------|------|---|
| | 16 | |
| Good | 14 | Most of the material of a high standard reflecting a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 12 | |
| | 10 | |
| Average | 8 | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any fundamental errors. Shows a sound understanding of most of the principles involved. |
| | 6 | |
| | 4 | |
| Poor | 2 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most if not all areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect |
| 0 | Material entirely irrelevant. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|--|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Additional notes on marking

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will be. These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally be drawn from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

M19. (a) progesterone/oestrogen;
luteinising hormone/LH;
oestrogen;

3

(b) little or no oestrogen;
produced by follicle;
oestrogen inhibits FSH;

3

[6]

M20. General principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------------|------|---|
| | 16 | |
| Good | 14 | Most of the material of a high standard reflecting a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 12 | |
| | 10 | |
| Average | 8 | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any fundamental errors. Shows a sound understanding of most of the principles involved. |
| | 6 | |
| | 4 | |
| Poor | 2 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most if not all areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect |
| 0 | Material entirely irrelevant. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|--|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Additional notes on marking this question

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will be. These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally come from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

M21. General principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------------|------|---|
| | 16 | |
| Good | 14 | Most of the material of a high standard reflecting a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 12 | |
| | 10 | |
| Average | 8 | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any fundamental errors. Shows a sound understanding of most of the principles involved. |
| | 6 | |
| | 4 | |
| Poor | 2 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balanced account making reference to most if not all areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect |
| 0 | Material entirely irrelevant. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|------|--|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

Additional notes on marking this question

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will be.

These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally come from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

M22. General principles for marking essay questions

Four skill areas will be marked:

Scientific content (**S**)

Breadth of knowledge (**B**)

Relevance (**R**)

Quality of written communication (**Q**)

These skill areas are marked independently of each other. Providing that there is sufficient evidence, and the subject content is relevant to the question answered, it is possible for candidates to obtain maximum credit for skill areas **B**, **R** and **Q**, even if they gain little credit for Scientific content.

The following descriptors will form the basis for marking.

Scientific content (Maximum 16 marks)

| Mark | Descriptor |
|------|---|
| 16 | Material accurate and of a high standard throughout, reflecting a sound understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. In addition, there are some significant references to material which indicates greater depth or breadth of study. |
| 14 | |
| 12 | Most of the material is of a high standard reflecting a sound understanding of the principles involved and a knowledge of factual detail generally in keeping with a programme of A-level study. Material accurate and free from fundamental errors, but there may be minor errors which detract from the overall accuracy. |
| 10 | |
| 8 | A significant amount of the content is of appropriate depth. Shows a sound understanding of most of the principles involved and a knowledge of factual detail generally in keeping with a programme of A-level study. Most of the content is accurate with few fundamental errors. |
| 6 | |
| 4 | Material presented is largely superficial with only occasional content of appropriate depth. Shows some understanding of some of the basic principles involved. If a greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| 2 | |
| 0 | Such material as is relevant is both superficial and inaccurate, rarely demonstrating evidence of knowledge in keeping with a programme of A-level study. |

Note: Only 0, 2, 4 marks etc. are awarded. This limits the number of categories and improves the consistency of marking.

Marks intermediate between descriptors may be awarded.

Breadth (Maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balance account making reference to most areas that might realistically be covered in an A-level course of study. |
| 2 | A number of areas covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant. |

Relevance (Maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is only of marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts are largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of written communication (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has generally been used effectively and is usually accurate. |
| 1 | The essay is poorly constructed. Often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

M23. General principles for marking essay questions

Four skill areas will be marked:

Scientific content (**S**)

Breadth of knowledge (**B**)

Relevance (**R**)

Quality of written communication (**Q**)

These skill areas are marked independently of each other. Providing that there is sufficient evidence, and the subject content is relevant to the question answered, it is possible for candidates to obtain maximum credit for skill areas **B**, **R** and **Q**, even if they gain little credit for Scientific content.

The following descriptors will form the basis for marking.

Scientific content (Maximum 16 marks)

| Mark | Descriptor |
|------|---|
| 16 | Material accurate and of a high standard throughout, reflecting a sound understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. In addition, there are some significant references to material which indicates greater depth or breadth of study. |
| 14 | |
| 12 | Most of the material is of a high standard reflecting a sound understanding of the principles involved and a knowledge of factual detail generally in keeping with a programme of A-level study. Material accurate and free from fundamental errors, but there may be minor errors which detract from the overall accuracy. |
| 10 | |
| 8 | A significant amount of the content is of appropriate depth. Shows a sound understanding of most of the principles involved and a knowledge of factual detail generally in keeping with a programme of A-level study. Most of the content is accurate with few fundamental errors. |
| 6 | |
| 4 | Material presented is largely superficial with only occasional content of appropriate depth. Shows some understanding of some of the basic principles involved. If a greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| 2 | |
| 0 | Such material as is relevant is both superficial and inaccurate, rarely demonstrating evidence of knowledge in keeping with a programme of A-level study. |

Note: Only 0, 2, 4 marks etc. are awarded. This limits the number of categories and improves the consistency of marking.

Marks intermediate between descriptors may be awarded.

Breadth (Maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | A balance account making reference to most areas that might realistically be covered in an A-level course of study. |
| 2 | A number of areas covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant. |

Relevance (Maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is only of marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts are largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of written communication (maximum 3 marks)

| Mark | Descriptor |
|------|---|
| 3 | Material is presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has generally been used effectively and is usually accurate. |
| 1 | The essay is poorly constructed. Often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

[25]

M24. Introduction

The essay is intended to assess a candidate's ability to bring together principles and concepts from different areas of biology, express ideas clearly and logically and use appropriate specialist vocabulary. It also provides an opportunity for candidates to demonstrate that they have met the ideals of stretch and challenge required to gain an A* grade. Because of this, essays are deliberately worded such that they allow candidates the freedom to respond in a variety of ways. Candidates are offered a choice of essay and it is important that the final mark reflects the quality of work, not the choice of essay.

The marking scheme considers four skill areas

- S** Scientific content
- B** Breadth of knowledge
- R** Relevance
- Q** Quality of written communication

In practice, this means that we are looking for

- evidence of knowledge and understanding in keeping with an A-level course of study
- selection of material relevant to the title, and drawn from different areas of the specification
- the ability to present an argument coherently and logically, using appropriate biological language.

Each of the skill areas is considered and matched against a series of descriptors to give the total mark. Notes are provided to assist in the application of the mark scheme to specific essay titles. Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will. The notes must therefore be seen as no more than guidelines providing an indication of areas of the specification from which suitable factual material may be drawn.

Plans should be considered in awarding marks. Examiners are instructed to ignore the plan when reading the essay. They should then return to the plan. If further credit can be awarded because of material contained in the plan, this is done. Under no circumstances can a candidate lose credit for incorrect information contained in the plan.

Assessing scientific content

In assessing this area, note the following

- The maximum mark is 16
- Only even marks are awarded (16, 14, 12 etc). Intermediate marks (15, 13, 11 etc) cannot be used. This restricts examiners' choice and increases the reliability of the marking.
- Descriptors are given for 16, 12, 8, 4 and 0 marks. Work is matched to these descriptors. If a particular essay is considered to fall between the criteria for two descriptors an intermediate even mark (14, 10, 6 etc) is awarded.
- Candidates have approximately 40 minutes to plan and write their essays. It is important that candidates who allocate their time wisely should be able to gain maximum marks for what it is possible to write in this time. In practice, this amounts to between three and four sides of normal handwriting.
- Essays do not have to be perfect to gain higher marks. The amount of detail required by the specification should always be born in mind. Average A-grade candidates should be able to achieve 12 marks so it would not be unreasonable to expect around 15% of candidates to achieve such a mark.

| Category | Mark | Descriptor |
|--------------|------|--|
| Exceptional | 16 | Material accurate and of a high standard throughout, reflecting a sound understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. In addition, there are some significant references to material that indicates greater depth or breadth of study. |
| | 14 | |
| Good | 12 | Most of the material is of a high standard reflecting a sound understanding of the principles involved and a knowledge of factual detail generally in keeping with an A-level course of study. Material accurate and free from fundamental errors, but there may be minor errors that detract from the overall accuracy. |
| | 10 | |
| Average | 8 | A significant amount of the content is of appropriate depth. Shows a sound understanding of most of the principles involved and knowledge of factual detail generally in keeping with a programme of A-level study. Most of the content is accurate with few fundamental errors. |
| | 6 | |
| Poor | 4 | Material presented is largely superficial with only occasional content of appropriate depth. Shows some understanding of some of the basic principles involved. If greater depth of knowledge is demonstrated, then there are fundamental errors. |
| | 2 | |
| Unacceptable | 0 | Such material as is relevant is both superficial and inaccurate. Fails to demonstrate evidence of knowledge in keeping with a programme of A-level study. |

In marking scientific content, the first decision to be made is the category into which the essay falls. Examiners will discuss a range of specimen scripts at the standardising meeting that help them to make this decision. In general:

An exceptional essay

- reflects the detail that could be expected from a comprehensive knowledge and understanding of relevant parts of the specification
- is free from fundamental errors
- maintains appropriate depth and accuracy throughout
- includes two or more paragraphs of material that indicates greater depth or breadth of study

A good essay

- reflects the detail that could be expected from a comprehensive knowledge and understanding of relevant parts of the specification
- is free from fundamental errors
- maintains appropriate depth and accuracy throughout

An average essay

- contains a significant amount of material that reflects the detail that could be expected from a knowledge and understanding of relevant parts of the specification. In practice this will amount to about half the essay.
- is likely to reflect limited knowledge of some areas and to be patchy in quality
- demonstrates a good understanding of basic principles but will contain some errors and evidence of misunderstanding

A poor essay

- contains much material which is below the level expected of a candidate who has completed an A-level Biology course although there will be occasional valid points
- Contains fundamental errors reflecting a poor grasp of basic principles and concepts

Having decided on the basic category, examiners may award the mark above or below this according to whether the candidate has exceeded the requirements or just failed to meet them.

Assessing breadth

In assessing this area, note the following

- The maximum mark is 3
- The mark scheme will include notes which indicate how the marks for breadth should be awarded for individual essays. In determining the mark awarded for breadth, content should ideally be taken from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is only taken from a single area, one mark should be awarded. However, this should only serve as a guide. The list is not exhaustive and examiners are prepared to offer credit for the incorporation of relevant material from other areas of study.
- Marks are awarded independently. Therefore it is possible for a candidate to gain full credit for breadth even though much of the essay is below the standard expected.

The general descriptors in the table below form the basis for awarding the mark for breadth.

| Mark | Descriptor |
|------|--|
| 3 | A balanced account making reference to most of the areas that might realistically be covered in an A-level course of study |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with almost all material based on a single aspect |
| 0 | Material entirely irrelevant |

The descriptors should be interpreted using these guidelines.

| Essay | The causes of disease in humans |
|--------------|---|
| Section | |
| 1.1 | Pathogens Pathogens include bacteria, viruses and fungi Pathogens cause disease by damaging cells and producing toxins |
| 1.3 | Cholera bacteria produce toxins resulting in diarrhoea |
| 1.4 | Symptoms and transmission of pulmonary tuberculosis |
| 2.10 | Horizontal gene transmission and MRSA |
| 1.1 | Lifestyle Risk factors associated with cancer and coronary heart disease |
| 1.4 | The effects of fibrosis, asthma and emphysema on lung function |
| 1.5 | The biological basis of heart disease |
| 2.2 | Genetics Differences in bases may lead to non-functional enzymes |
| 2.5 | Relationship between the cell cycle and cancer |
| 5.6 | Proto-oncogenes and tumour suppressor genes Gene mutations |

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M25. Introduction

The essay is intended to assess a candidate's ability to bring together principles and concepts from different areas of biology, express ideas clearly and logically and use appropriate specialist vocabulary. It also provides an opportunity for candidates to demonstrate that they have met the ideals of stretch and challenge required to gain an A* grade. Because of this, essays are deliberately worded such that they allow candidates the freedom to respond in a variety of ways. Candidates are offered a choice of essay and it is important that the final mark reflects the quality of work, not the choice of essay.

The marking scheme considers four skill areas

- S** Scientific content
- B** Breadth of knowledge
- R** Relevance
- Q** Quality of written communication

In practice, this means that we are looking for

- evidence of knowledge and understanding in keeping with an A-level course of study
- selection of material relevant to the title, and drawn from different areas of the specification
- the ability to present an argument coherently and logically, using appropriate biological language.

Each of the skill areas is considered and matched against a series of descriptors to give the total mark. Notes are provided to assist in the application of the mark scheme to specific essay titles. Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will. The notes must therefore be seen as no more than guidelines providing an indication of areas of the specification from which suitable factual material may be drawn.

Plans should be considered in awarding marks. Examiners are instructed to ignore the plan when reading the essay. They should then return to the plan. If further credit can be awarded because of material contained in the plan, this is done. Under no circumstances can a candidate lose credit for incorrect information contained in the plan.

Assessing scientific content

In assessing this area, note the following

- The maximum mark is 16
- Only even marks are awarded (16, 14, 12 etc). Intermediate marks (15, 13, 11 etc) cannot be used. This restricts examiners' choice and increases the reliability of the marking.
- Descriptors are given for 16, 12, 8, 4 and 0 marks. Work is matched to these descriptors. If a particular essay is considered to fall between the criteria for two descriptors an intermediate even mark (14, 10, 6 etc) is awarded.
- Candidates have approximately 40 minutes to plan and write their essays. It is important that candidates who allocate their time wisely should be able to gain maximum marks for what it is possible to write in this time. In practice, this amounts to between three and four sides of normal handwriting.
- Essays do not have to be perfect to gain higher marks. The amount of detail required by the specification should always be born in mind. Average A-grade candidates should be able to achieve 12 marks so it would not be unreasonable to expect around 15% of candidates to achieve such a mark.

| Category | Mark | Descriptor |
|--------------|-----------|--|
| Exceptional | 16 | Material accurate and of a high standard throughout, reflecting a sound understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. In addition, there are some significant references to material that indicates greater depth or breadth of study. |
| | 14 | |
| Good | 12 | Most of the material is of a high standard reflecting a sound understanding of the principles involved and a knowledge of factual detail generally in keeping with an A-level course of study. Material accurate and free from fundamental errors, but there may be minor errors that detract from the overall accuracy. |
| | 10 | |
| Average | 8 | A significant amount of the content is of appropriate depth. Shows a sound understanding of most of the principles involved and knowledge of factual detail generally in keeping with a programme of A-level study. Most of the content is accurate with few fundamental errors. |
| | 6 | |
| Poor | 4 | Material presented is largely superficial with only occasional content of appropriate depth. Shows some understanding of some of the basic principles involved. If greater depth of knowledge is demonstrated, then there are fundamental errors. |
| | 2 | |
| Unacceptable | 0 | Such material as is relevant is both superficial and inaccurate. Fails to demonstrate evidence of knowledge in keeping with a programme of A-level study. |

In marking scientific content, the first decision to be made is the category into which the essay falls. Examiners will discuss a range of specimen scripts at the standardising meeting that help them to make this decision. In general:

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A good essay

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An average essay

- contains a significant amount of material that reflects the detail that could be expected from a knowledge and understanding of relevant parts of the specification. In practice this will amount to about half the essay.
- is likely to reflect limited knowledge of some areas and to be patchy in quality
- demonstrates a good understanding of basic principles but will contain some errors and evidence of misunderstanding

A poor essay

- contains much material which is below the level expected of a candidate who has completed an A-level Biology course although there will be occasional valid points
- Contains fundamental errors reflecting a poor grasp of basic principles and concepts

Having decided on the basic category, examiners may award the mark above or below this according to whether the candidate has exceeded the requirements or just failed to meet them.

Assessing breadth

In assessing this area, note the following

- The maximum mark is 3
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| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with almost all material based on a single aspect |
| 0 | Material entirely irrelevant |

The descriptors should be interpreted using these guidelines.

| | |
|--------------------|--|
| Essay | Carbon dioxide may affect organisms directly or indirectly. Describe and explain these effects. |
| Section | |
| 1.4 4.3 5.1 | Carbon dioxide affects the physiology of organisms Pulmonary ventilation and the mechanism of breathing Light-independent reaction of photosynthesis. Limiting factors Role of chemoreceptors in controlling heart rate |
| 4.6 | The direct effects of increasing carbon dioxide concentration Respiration, photosynthesis and human activity giving rise to short-term fluctuations and long-term change. Yield of crop plants Carbon cycle |
| 4.6 1.2 | Indirect effects of increasing carbon dioxide concentration Role of carbon dioxide in producing global warming; Life cycles and number of insect pests; Distribution of animals and plants; Effect of temperature on enzymes; |

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M26. Essay A cycle is a biological pathway or process in which the end product of one cycle becomes the starting point for the next. Write an essay about cycles in biology.

Section

Ecological cycles

4.6 Nutrient cycles

Carbon cycle

Nitrogen cycle

Biochemical cycles

1.2 Enzyme action

4.2 Synthesis of ATP from ADP

4.3 Light-independent reaction

4.4 The Krebs cycle

Physiological and genetic cycles

1.4 The mechanism of breathing

1.5 The cardiac cycle

2.5 The cell cycle

5.3 Muscle contraction

5.5 Oestrous cycle

M27. Essay Using DNA in science and technology

DNA and classification

2.2 Structure of DNA

2.3 Differences in DNA lead to genetic diversity

2.9 Comparison of DNA base sequences

DNA hybridisation

Genetic engineering and making useful substances

2.5 Plasmids

5.8 The use of recombinant DNA to produce transformed organisms that benefit humans

Other uses of DNA

2.5 Cell cycle and treatment of cancer

5.8 Gene therapy;

Medical diagnosis and the treatment of human disease;

The use of DNA probes to screen patients for clinically important genes.

M28. Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will be. In fact, extra credit is given for those who show evidence of a greater breadth of study. These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally come from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

Essay – How bacteria can affect the lives of humans and other organisms

Bacteria & Disease

3.1.1 Pathogens

3.1.2 Lactose intolerance

3.1.3 Cholera

3.1.4 Tuberculosis

3.2.10 Resistance to antibiotics

Ecological Importance

3.4.6 Carbon cycle

3.4.6 Nitrogen cycle

3.4.6 Eutrophication

Making Use of Bacteria

3.5.8 Use of bacterial enzymes

e.g. restriction endonuclease, DNA polymerase for PCR

3.5.8 Use of bacterial plasmids

e.g. *in vivo* gene cloning, genetically-modified crops, gene therapy

3.5.8 Use of bacteria to produce useful chemicals

M29. Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will be. In fact, extra credit is given for those who show evidence of a greater breadth of study. These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

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Essay – The importance of shapes fitting together in cells and organisms

Proteins & Enzymes

3.1.2 Enzyme properties and digestion

3.1.2 Protein structure

3.1.3 Plasma membrane structure and cell transport

3.1.6 Antigens, antibodies, B cells & T cells

3.1.6 Vaccines

Nucleic Acids

3.2.2 Structure of DNA

3.2.5 DNA Replication (not PCR)

3.5.7 Transcription & translation

3.5.8 Transcriptional factors, oestrogen, siRNA

3.5.8 Restriction enzymes

Physiology

3.2.4 Haemoglobin

3.5.2 Action potentials & synaptic transmission

3.5.3 Muscle contraction

3.5.4 Control of blood glucose concentration

3.5.5 Control of mammalian oestrous cycle

